AMENDMENTS TO THE SPECIFICATION

On pages 1 and 2, please amend the current paragraph from line 10 of page 1 to line 10 of page 2 as follows:

Since their first discovery and report ~~of carbon nanotubes of single-wall and multi-wall~~ in 1991, carbon nanotubes of single-wall and multi-wall have drawn wide attention due to their ~~for its~~ particular length-diameter ratio, mechanical propertys of super-toughness, and other~~'s~~ excellent thermal, optical and electronic ~~thermics, optics and electronics~~ properties. Moreover, they have been suggested for ~~many~~ potential applications in fields of ~~electron~~ field emission, electrodes~~polar~~ of lithium cells, probes of scanning probe microscopes~~y~~ and semie-conductor~~ting~~ electronics. However,~~But one~~ the main cause~~reason that application study~~ of a failure of research of carbon nanotubes ~~has not made~~ to achieve a breakthrough ~~progress~~ until now is their insolubility, which makes it difficult to obtain a monolayer carbon nanotubes array,~~ing~~ which is homodispersed~~ith equably dispersion and~~ over a large area arranged~~ement~~ in order. Sprayed carbon nanotubes~~SWCNT~~ thin films are used to measure carbon nanotubes' optical absorption spectra~~, in order to~~ , which can establish the relationship between the density of states distribution and the diameter of carbon nanotubes. This relationship ~~, and to~~ elucidates the mechanisms that ~~by which~~ chemical and electrochemical doping or high pressure used to modify ~~the carbon nanotubes'~~ electronic states in carbon nanotubes. But ~~For~~ in such sprayed films,~~ however,~~ the ~~inhomogeneous~~ uneven aggregation of carbon nanotubes inevitably brings about a rough surface, resulting in a ~~due to~~ lack of control of the orientation and thickness ~~and orientation~~ of the deposited carbon nanotubes. The development of rational processing techniques for carbon nanotubes is crucial for their technological applications and further understanding of their ~~fundamental~~ basic properties. Particularly, ~~the realization of uniform thin films with controlled~~ film thickness and the control of orientation of carbon nanotubes are~~orientation is~~ important for the application of ~~a number of~~ new optical and electric ~~characterization~~ techniques. The Langmuir-Blodgett (LB) technique is a common method for preparation of the molecular film, which ~~is to~~ involves ~~disperse~~ dispersing bi-lipophilic ~~molecular~~ molecules insoluble in water into pure~~ified~~ water in sub-phase to form a super-thin

monolayer ~~in~~ on liquid surface, evaporating ~~after~~ organic solvent ~~is volatilize out~~, ~~then to concentrate and transfer~~ concentrating and transferring the monolayer in a controlled fashion, ~~by control, and to test~~ testing molecular film-pressure of ~~molecular on~~ liquid surface by precise electronic-microbalance, and finally ~~to form LB~~ forming LB molecular films ~~film~~. ~~For~~ However, because carbon nanotubes are insoluble in any solvents, it is impossible to form LB films directly from carbon nanotubes~~them~~. Kristic et al. reported (~~in~~ Synthetic Metals 2000, ~~of~~ Vol. 100, page 245-249 ~~in 2000~~)that monolayer carbon nanotubes ~~monolayer~~ could be prepared by dispersing carbon nanotubes in ~~a~~ the surfactant of lithium dodecyl sulfate in~~on~~ a sub-phase of aqueous solution. The monolayer molecules ~~molecular~~ could be horizontally deposited onto solid substrates. However, due to their limited solubility in aqueous solution, the ~~concentration~~ density of the deposited monolayer carbon nanotubes ~~in the deposited monolayer~~ is quite low (<7%), so that neither deposition nor the control of the nanotube orientation is achieved by this method.

On page 2, please amend the current paragraph at lines 13-18 as follows:

The object of this invention is to overcome the disadvantages of the existing techniques, and to provide a control method of arranging carbon nanotubes selectively orientationally on the surface of a substrate. LB technique is used to achieve the deposition of the monolayer and multiplayer orientational film of carbon nanotubes on the surface of all kinds of substrates. UV-visible-IR absorption spectra, quartz crystal micro-balance (QCM), AFM and polarized Raman spectra are used to investigate the quality of the carbon nanotube molecular film and the arraying direction of carbon nanotubes.

On page 2, please amend the current paragraph at line 22 as follows:

Step 1) A solid ~~Solid~~ substrate is subjected to a ~~treated to be~~ hydrophilic or hydrophobic treatment.

On page 2, please amend the current paragraph at lines 23 - 25 as follows:

Step 2) Organic macromoleculesar with a hydrophilic and hydrophobic end is ends are combined to the surface of every carbon nanotubes which has been purified routinely, and then the resulted carbon nanotubes areis dissolved into water or organic solvent.

On page 2, please amend the current paragraph at lines 26 - 28 as follows:

Step 3) The said solution is spread onto the surface of water in sub-phase, then after the water or the organic solvent has been volatile vaporized out, the surface pressure-surface area isotherm of the carbon nanotube thin film with single molecular molecule thickness on the water surface is controlled to compress the film.

On page 2, please amend the current paragraph at lines 29 - 30 as follows:

Step 4) The resulted carbon nanotube film with single layer molecule thickness is transferred to the surface of the said solid substrate to form the arrangement layer of selectively oriented carbon nanotubes.

On page 3, please amend the current paragraph at lines 1 - 3 as follows:

Hydrophilic treatment of the said solid substrate is performed to by submergingsubmerge the substrate into concentrated acid at above 50℃, and the hydrophobic treatment of that the substrate is performed by silanizing to silanize the substrate[[s]] after the hydrophilic treatment. --

On page 3, please amend the current paragraph at lines 5 - 8 as follows:

The said carbon nanotubes combined with organic macromoleculesar with a hydrophilic and hydrophobic end is ends are made by first sulfating or nitrifying the carbon nanotubes embodied as that carbon nanotubes will be sulfated/nitridized firstly to form carboxyl groups at each end and the side of the tube, and then by acylating and aminating acylated and aminated to attach the organic macromoleculesar.

On page 3, please amend the current paragraph at lines 9 - 10 as follows:

In step 3), ~~Wherein,~~ for the control of the surface pressure-surface area isotherm of the carbon nanotube single-molecular thin film, the ~~is controlled during step 3) with~~ pressure of the film is ~~about~~ 20-50mN/m.

On page 3, please amend the current paragraph at lines 11 - 13 as follows:

In addition, high energy light irradiation ~~of high energy~~ is applied to the carbon nanotube monolayer film formed in step 4), ~~in order~~ so that some organic macromolecules~~ar~~ with hydrophilic and hydrophobic ends are decomposed and evaporated from the substrate.

On page 3, please amend the current paragraph at line 14 as follows:

-- The ~~Here the~~ high energy light irradiation can be UV irradiation.

On page 3, please amend the current paragraph at lines 15 - 16 as follows:

Of course, hundreds of layers can be obtained by controlling pressure of film and repeating the transferring~~above~~ procedures.

On page 3, please amend the current paragraph at lines 17 - 23 as follows:

Uniform multiplayer films of carbon nanotubes with controllable thickness have been prepared by the LB technique. In the films, chemically modified carbon nanotubes are oriented almost along ~~the~~ one orientation (a selected orientation). C~~, thus, c~~arbon nanotubes molecular film of controlled thickness and orientation control of tubes may help pave the way to the development of molecular devices using carbon nanotubes. What's more, this technique ~~those devices~~ can be used to characterize ~~the electrical and~~ optical and photoelectric properties of carbon nanotubes, such as for testing the electrical conductivity of nanomaterials and producing the nano raster. --

On pages 3 and 4, please amend the current paragraph from line 24 of page 3 to line 1 of page 4 as follows:

This invention possesses substantial characteristics and notable improvements. The array direction of carbon nanotubes can be controlled artificially, that is to say, the array direction of carbon nanotubes in carbon nanotubes thin film can be controlled by outer pressure during the preparation. Then the obtained carbon nanotube thin film can be successfully transferred onto both~~either~~ the hydrophobic and the hydrophilic surface of solid substrates. Organic ~~in~~-chain molecules which ~~is~~ are introduced during preparation can be removed successfully by decomposing and evaporating from the substrate after high energy light irradiation ~~of high energy~~, while carbon nanotubes film itself ~~can~~ will not be disrupted on the substrate because of its high stability. --

On page 4, please amend the current paragraph at lines 4 - 5 as follows:

Fig. 1 shows the relationship between the surface tension and the area of a molecular film ~~pressure-area isotherm~~ ($\pi - A$ isotherm) of water in sub-phase after a carbon nanotubes-chloroform solution of the invention is dispersed on the water surface~~of chloroform sultion~~.

On page 4, please amend the current paragraph at line 6 as follows:

-- Fig. 2 shows the UV-visible-IR absorption spectra of carbon nanotubes LB films.

On page 4, please amend the current paragraph at lines 8 - 14 as follows:

~~As shown in fig.~~ Referring to Figs. 1 and 2, the invention ~~combined with figures~~ will be described further as follows. A solid substrate is submerged into ~~50℃~~ concentrated nitric acid at 50℃ or ~~further~~ is further treated by silanization. The carbon nanotubes are purified by normal concentrated acid, heating ultrasonic, and filtration et al. and cut off. ~~by normal concentrated acid, heating, ultrasonic, and filtration et al.~~ Firstly, long ~~Long~~ carbon nanotubes will be cut short ~~firstly~~ at the point of defects[[,]]; secondly, the carbon nanotubes will be ~~then~~ sulfated and /or (nitrified~~dized~~) to form carboxylic groups at both ends and sides of the carbon nanotubes[[,]]; thirdly, the carbon nanotubes will be acyl-chlorinated and acyl-aminated to attach organic ~~macromoleculars,~~ macromolecules; and finally, the carbon nanotubes will be dissolved int~~o~~ chloroform

solvent.

On page 4, please amend the current paragraph at lines 15 - 29 as follows:

After the above steps, 400 μl chloroform solution with a carbon nanotubes concentration of 0.1-0.5 *mg / ml* ~~of carbon nanotubes~~ is spread uniformly on the surface of water ~~surface~~ in sub-phase to measure $\pi - A$ isotherms after chloroform is ~~volatile~~ vaporized out. As shown in Fig. 1, there is a steep rise in surface pressure ~~and~~, coupled with high negative pressures (20-50 mN/m), and the shape of the isotherm doesn't significantly depend on temperature. The surface film in sub-phase is compressed ~~continuously~~ at a film pressure ~~speed~~ of 20-50 mN/m~~. in order~~ so that the carbon nanotube molecules get closer and closer and adjust their attitudes mutually~~one another~~. The pressure of the film begins to stay ~~keeps~~ unchanged when ~~until~~ those molecules lay compactly. After the vibration and the particular orientation of carbon nanotubes are completed, the molecular film is in orientation and order. The carbon nanotubes film on the surface of the liquid are ~~lift~~ lifted and successfully transferred onto the surface of the above solid substrates to form a carbon nanotubes arraying layer, with a transfer ratio of 0.97-0.99. The above compressing and lifting are completed by ~~an~~ LB equipment which ~~equips~~ is equipped with a computer's controlling system and a Wilhelmy balance. The surface area of the carbon nanotubes monolayer on the water surface is related to ~~depends on~~high negative pressure. Extrapolation of the steeply rising portion of the $\pi - A$ isotherms to zero pressure gives the occupied surface area of the compressed ~~condensed~~ monolayer on the water surface. The density of carbon nanotubes is ~~approximately~~ approximately 2.0×10^{-4} mg/cm^2..

On page 5, please amend the current paragraph at lines 1 - 7 as follows:

Judged from the radial breathing model of the Raman spectrum at 170cm^{-1}, the average diameter of solubilized carbon nanotube is about 1.32nm, which means, considering the geometrical size, that there are ~~geometrically corresponds to~~ 158 carbon atoms per 1 nm length along the tube axis and the surface ~~. Surface~~ density of ~~close~~ closely packed carbon nanotube monolayer is 2.39×10^{-4} mg/cm^2. In the experiment, the

monolayer is formed by carbon nanotubes with attached organic chain molecules that comprise hydrophilic and hydrophobic ends, and the experimental value of the surface density of the carbon nanotube monolayer (about 2.0×10^{-4} mg/cm^2) is 16.3% lower than the calculated value. ~~2.39×10^{-4} *mg/cm*^{2}, while experimental value is about 2.0×10^{-4} *mg/cm*^{2} because the formation of carbon nanotubes monolayer on water surface attribute to chains molecular adhering to on it that has a hydrophilic and hydrophobic end. About 16.3% smaller than the calculated value~~ The result suggests that carbon nanotubes distribute loosely in the monolayer.

On page 5, please amend the current paragraph at lines 8 - 21 as follows:

The transfer ratio of carbon nanotubes formed by the above ~~step~~ steps is 0.8. ~~As shown in fig.2, t~~The UV-visible-IR absorption ~~spectra of carbon nanotubes LB films~~spectrum of carbon nanotube LB films is shown in Fig. 2. ~~, each spectrum~~ It displays three major absorption peaks at 1820, 1000 and 700nm respectively. The first two of the three are caused by the property of semiconductor carbon nanotubes, which come from the optical transitions between inner bands, ~~the first and the second inter band optical transitions in semi-conducting carbon nanotubes~~ and the last one is from optical transitions in metallic carbon nanotubes. The peak absorbance coefficient at 1820nm is perfectly linear to ~~plotted against~~ the number of layers after testing from the ~~gives a perfectly straight line up~~ first to the 14th layers. The result ~~This~~ demonstrates that the layer-by-layer deposition of LB films and precise control of the thickness of homogeneous multilayer LB films are ~~, multiplayer LB films with precisely controlled thickness is~~ successfully achieved. ~~At a~~When surface pressure ~~of~~ is 20-50mN/m, the carbon nanotubes monolayer is deposited on the tip area of a ~~the end face of the~~ quartz crystal micro-balance ~~tip~~ (tip area=0.196cm^2) to form LB film. The mass of ~~carbon nanotube~~LB film ~~on the tip~~ increases with the number of layers, which also give a ~~close~~ good linear relationship. This result further suggests that [[a]] the carbon nanotubes have formed ~~carbon nanotube form~~ a fairly uniform LB film. After 14 layers have been deposited, the mass of carbon nanotube LB film on the tip is 8.23×10^{-7} g, ~~8.23×10^{-7} g,~~

which is close to ~~consistent with~~ the value of 1.1×10^{-6}g~~1.1×10^{6} g~~ calculated from the limited~~ing~~ surface area of 2.0×10^{-4} mg/cm^2.

On page 5, please amend the current paragraph at lines 22 - 26 as follows:

When the prepared carbon nanotube LB monolayer film is observed ~~using~~ by AFM, due to the existence of chain molecules with hydrophilic and hydrophobic ends, the resolution of the AFM tip is reduced. ~~no clear images are obtained due to the effect of long chains with a hydrophilic and hydrophobic end, which reduce the resolution of AFM tip.~~ After further treatment ~~for this~~, for example under UV irradiation for a short time, some chain moleculess are decomposed and evaporated from the substrate, while carbon nanotubes remain on the substrate because of its high stability.

On pages 5 and 6, please amend the current paragraph from line 27 of page 5 to line 4 of page 6 as follows:

The orientation of carbon nanotubes in LB film is further investigated by means of polarized Raman spectroscopy. Raman peaks at 170 and 1590 cm^{-1} attributes to the radial breathing mode and tangential stretching G-bond modes, respectively. The peak intensities vary with the measure angle between the polarization direction and the nanotube axis. Particularly, the experimental intensities of G-bond modes exhibit a characteristic minimum near 60°, which is in excellent agreement with the theory value of carbon nanotubes. (Theoretically, the intensity of the tangential mode is expected to exhibit a minimum at $\theta = 54.7°$)

On page 6, please amend the current paragraph at lines 5 - 7 as follows:

This invention is not limited to the ~~in~~ above examples. Other organic ~~volatile~~ solvents that dissolve ~~the~~ carbon nanotubes ~~can also be dissolved into,~~ can be chloroform and dichloromethane et al. The carbon nanotubes can also be attached with amine molecules to be ~~and~~ dissolved in water or ethanol solvents.